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Comparison of the Effectiveness and Efficiency of Direct Instruction and Simultaneous Prompting in Teaching Hot, Cold, Hard, and Soft Concepts to Individuals with Autism Spectrum Disorder

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ABSTRACT
There are significant difficulties teaching concepts to individuals with ASD, primarily abstract concepts. Many studies, from sensory integration studies to occupational therapy studies, from the academic dimension of special education to the affective dimension, are trying to solve this problem. This study aimed to determine the effectiveness and efficiency of direct instruction and simultaneous prompting in teaching hot, cold, hard, and soft concepts to students with autism spectrum disorder. The research model is the parallel treatment model, which is a single-subject research model. The dependent variable of the research was determined as the concepts of hot, cold, hard, and soft, and the independent variables were the levels of direct instruction and simultaneous prompting. Daily probe, collective probe, and follow-up sessions were planned and implemented for the four concepts identified in the research for direct instruction and simultaneous prompting. For each concept constituting the dependent variable of the research, the researcher prepared tool sets that exemplify the target behavior and include opposite concepts. Concept tracking checklists, criterion-dependent measurement tools, application reliability, and social validity forms were developed and used to collect research data. The research was conducted with the participation of four 7-year-old students, two girls and two boys, with autism spectrum disorder, attending the Autism Studies Application and Research Center. As a result of the research, the direct teaching method is more effective and efficient than the simultaneous prompting teaching method in comparing the effectiveness and efficiency of four subjects in gaining the concepts in the application process.

Keywords: Autism spectrum disorder, direct instruction, concept instruction, simultaneous prompting, single subject.

Introduction

Concept learning begins with the individual's birth and continues throughout his or her life. While many learning experiences happen spontaneously in life, they are purposefully guided in some cases. Concept learning occurs more rapidly in the early stages of a child's life. No matter the learning method, concepts are generally learned in two stages (Doğanay, 2005). The first stage involves creating the concept, and the second stage involves acquiring the concept. According to Ülgen (2004), concept learning includes categorizing stimuli, forming mental representations, and organizing and participating in structuring activities. Concept teaching involves identifying the concept's related components and unrelated distinctions and creating its taxonomic classification. In addition, concept teaching requires the use of positive and negative examples of the concept (Özyürek, 1983; Vuran, 2008). The importance of concept learning in special education and how it works is much more critical (Koçak & Sarı, 2021b). Concept teaching studies, especially concrete concepts, can critically improve these individuals' sensory, language, and daily life skills, especially in teaching students with autism spectrum disorder (ASD).

There may be significant difficulties teaching concepts to individuals with ASD, especially abstract concepts. Many studies, from sensory integration studies to occupational therapy studies, from the academic dimension of special education to the affective dimension, are trying to solve this problem. Even in teaching concrete concepts such as hot, cold, hard, and soft to students with ASD, there may be difficulties for individuals with affective processing difficulties. Concepts such as hot, cold, hard, and soft can help individuals with ASD understand and express their environment (Rasmussen et al., 2022). Such concrete concepts can also help develop language and communication skills, and they can express what they feel and think more effectively (Knight et al., 2013). In addition, teaching concepts such as hot, cold, hard, and soft can help students gain daily life skills. For example, students can use concepts such as hot and cold when cooking and hard and soft when choosing clothes (Cadette et al., 2016). Concepts such as hot and cold can also relate to emotional expression and social interaction. Students with ASD can learn to empathize and understand others' feelings through these concepts (Ferris, 2015). Rasmussen et al., 2022; Albert and Troutman, 2006 claim that teaching concrete and sensory expression-facilitating concepts to children with ASD improves their sensory awareness and social interaction skills. Dogan and Ozen, 2022; Vuran, 2008 stated that teaching concepts such as hot, cold, hard, and soft also helps children gain daily life skills.

In general, the direct teaching method, one of the most frequently used teaching methods in the education of students with ASD, is skill-centered, and the learning it provides is teacher-led. It is based on teachers' face-to-face training in lessons (Güneş, 2022; Karabulut et al., 2021; Koçak & Sarı, 2021a). Direct instruction makes the student act independently by gradually withdrawing the clues of the behavior to be gained. In the acquisition of behaviors by direct instruction, the actions of the teacher and the student are arranged in advance. When teaching starts, all responsibility falls on the teacher, which gradually passes to the student. While doing this, the teacher asks the student about the sub-skills that the student already knows and reinforces the correct answers. Students with autism spectrum disorder (ASD) often need to go through a challenging and individualized learning process to learn new concepts. According to Kurt (2006), teaching a specific skill or concept to children with ASD using a step-by-step approach to organizing helps students acquire concept acquisition skills. Kristie Asaro-Saddler (2016) stated that this strategy/method helps students focus on a particular subject and increases their ability to function independently. There are studies on the use of simultaneous prompting, which is another teaching method. Teaching with simultaneous prompting (Tekin, 2000), an errorless teaching method, is a response prompting method used effectively and efficiently in teaching single-step and chain behaviors to students in various disability groups. In simultaneous teaching (Sazak et al., 2020), a systematic adaptation of pre-behavioral prompting and testing, the target stimulus, and the controlling prompt are presented together, and the individual takes the controlling cue as a model. In teaching with

simultaneous prompting, the individual is not allowed to react independently because the controlling prompt is presented in each trial.

Using cues with appropriate timing and intensity can increase student learning and improve independent living (Rasmussen et al., 2022). In particular, the use of teaching methods with prompts enables students to acquire many skills on their own (Yücesoy-Özkan & Altun, 2019; Aydın & Tekin-İftar, 2020). According to Batu et al., 2014; Kızılkaya & Sarı, 2021; Özkubat et al., 2021, the use of visual cues and concrete examples can improve conceptual understanding. These methods can be used in a student-specific way, considering the student 's age, interests, and preferred teaching method (Çay, 2019). Through comparative research, Koegel et al. (1999) found that conceptual skills can be learned faster when direct instruction is paired with simultaneous prompt instruction. Studies have also examined how these methods can be used with students of different ages with ASD and students from various cultural backgrounds and age groups (Charlop-Christy et al., 2002). According to Rogers and Vismara (2008) and Karasu (2009), the effectiveness of these methods can be affected by various variables, including the teacher's level of expertise, the unique needs of the student being trained, the teaching materials used, and the environment in which the training occurs. Direct and simultaneous prompt instruction can increase conceptual understanding, improve social and language skills, and enable independent learning easily and quickly in students with ASD.

Aim

This research compares the effectiveness and efficiency of direct and simultaneous prompting in teaching the concepts of hot, cold, hard, and soft to students with ASD. In line with this purpose, answers to the following questions were sought as subobjectives: (1) Does the level of acquisition of "hot" and "cold" concepts taught to Student 1 by direct teaching differ from "hard" and "soft" concepts taught using simultaneous prompting? (2) Does the level of acquisition of "hard" and "soft" concepts taught to Student 2 by direct teaching differ from "hot" and "cold" concepts taught using simultaneous prompting? (3) Does the level of acquisition of "hot" and "cold" concepts taught to Student 3 by direct teaching differ from "hard" and "soft" concepts taught using simultaneous prompting? (4) Does the level of acquisition of "hard" and "soft" concepts taught to Student 4 by direct teaching differ from "hot" and "cold" concepts taught using simultaneous prompting? (5) When concepts with independent variables are taught to students with autism spectrum disorder using direct instruction and simultaneous prompting, does the effectiveness of the two methods differ in the follow-up sessions held at the first, third, and fifth weeks after the instruction? (6) Do the efficiencies of direct instruction and simultaneous prompt instruction differ in teaching concepts that are independent variables to students with autism spectrum disorder? (7) What are the views (social validity findings) of the mothers of the students who were treated about teaching hot, cold, hard, and soft concepts to their students with autism spectrum disorder, and the methods and tools used in this process?

Methods

Research Model

Single-subject research is defined as studies in which the effectiveness of an application is evaluated within each subject by taking repeated measurements under standard conditions (Rasmussen et al., 2022; Albert & Troutman, 2006; Tekin, 2000; Karasu, 2009). In the study, which compares the effectiveness and efficiency of direct instruction and simultaneous prompting in teaching hot, cold, hard, and soft concepts to students with autism spectrum disorder, the parallel treatments model, a single-subject research model, was used. The parallel treatments model is an approach that includes statistical analysis, which is used to compare the effects and efficiency of two or more independent variables on two or more non-retroactive dependent variables in a certain period (Tekin, 2000). Tekin (2000) states that the parallel treatment model allows one to examine the relationships between different independent variables and compare the effectiveness and efficiency of these variables with the dependent variable.

The instruction sets for sampling the dependent variable were prepared at the same difficulty level using the parallel treatment model. The independent variable associated with the instruction set was then determined by neutral assignment. In accordance with the research method, it was ensured that the independent variables were used alternately. Practice sessions were repeated an equal number of times with the students.

The application steps of the parallel treatment model in this study are as follows: (1) The study's dependent variables were determined as hot, cold, hard, and soft. Instructional sets were created for the dependent variables of the study. In each toolkit, at the first level, one material exemplifying the target behavior and one material exemplifying the concept that has an antonym with that concept were used. (2) Both direct instruction and simultaneous prompting sessions were planned for the four concepts aimed to be taught in the study. First the teaching of the concepts of hot and hard were studied with the subjects. It was determined that the method to which the hot concept would be applied to which subject was determined by neutral assignment, and thus, it was determined that the soft concept would also be taught with the other method. (3) Then, the transformation of the independent variables is provided. Two independent variables were applied one hour apart in one day. The order in which the independent variables were presented was arranged in an unpredictable order by the subjects. (4) Subjects were not given terminology about the method used; however, a warning expression, an address, indicated that a different study was started and another followed one teaching method. (5) Practice sessions were arranged for each subject twice a week. When the criterion (8/10) was reached in three consecutive sessions in a subject and a teaching method, the application of the other method was terminated.

In the study, the parallel treatment model was arranged in the following order: (1) Baseline (first probe phase) data were collected for each subject to obtain at least three stable data points for the four concepts to be taught. After obtaining stable data points, the implementation phase, in which the concepts of "hot", "hard", "cold," and "soft" were taught, started with four subjects. (2) All four concepts were analyzed in three steps. The concepts of hot and soft were applied in the first step of the application sessions. Teaching was presented with the first five sets of 10 tool sets prepared for each step, and after this instruction was completed, a five-minute break was taken, and the post-teaching step was evaluated with the other five toolsets. (3) Except for the first teaching session, daily probe sessions were held with ten toolkits prepared to evaluate the concept's steps before the other sessions. The second full probe phase was organized after the 8/10 criteria were met at three consecutive points in the daily probe sessions. (4) In the second full probe phase, probe sessions were held on the concepts of "soft", "hot", "hard," and "cold". In these sessions, when stability was achieved in the probe data points for the concepts of "hard, cold", these two concepts were taught. The third collective probe phase was initiated after the 8/10 criteria were met at three consecutive points in the daily probe sessions. (5) In the third full probe phase, probe sessions were held for the four concepts studied. (6) Follow-up sessions were held in the first, third, and fifth weeks following the last probe session.

In this study, possible factors were tried to be controlled as described below. To control external factors, the subjects' parents and other individuals thought to be able to provide instruction were informed that no application should be made about the concepts thought to be taught. Since no preliminary evaluation is made in single-subject studies, as in group studies, the testing effect did not pose a threat in this study. For the measurement effect, the session recordings were monitored by an observer from a faculty member in the special education department, and reliability analyzes were calculated for the dependent-independent variable. For the parallel treatment model, starting the study with four or five subjects is recommended. Therefore, four subjects who met all the conditions were included in the study. The multi-probe effect has two dimensions. These are (a) carrier effect and (b) sequencing effect (Tekin, 2000). A carrier effect occurs when one application affects another. The sequencing effect is the effect of the previous application on the subsequent application. The use of more than one independent variable may result in the effect of multiple probes in the application process. A balanced distribution of independent variables was provided to control for the effect of multiple probes. The methods were presented in an order that the subjects could not predict.

Setting

To teach the concepts to students with autism spectrum disorder using direct instruction and simultaneous prompting, the probe, application, and follow-up sessions were conducted in a one-on-one teaching arrangement in one of the 40 square meters observation, evaluation, and individual training rooms of Necmettin Erbakan University, Autism Studies Application and Research Center. There was a table and two chairs suitable for the subject's height in the room where the practitioner and the subject could sit opposite each other. In the room where the studies were conducted, there was a material cabinet with a lid, a teacher's desk, and a chair. Each subject was planned to attend one session in succession with an interval of one hour twice a week. The teaching program was planned as follows: with Student 1 between 10:30 and 12:30 on Mondays and Wednesdays, with Student 2 between 13:30 and 15:30 on Mondays and Wednesdays, with Student 3 between 10:30-12:30 on Tuesdays and Thursdays, and with Student 4 between 13:30 and 15:30 on Tuesdays and Wednesdays. Since the transformation of the methods used in the research was carried out during the day, both methods were applied one hour apart.

Materials and Tools

The instruction sets used in the research were composed of concept cards consisting of pictures of real objects called target stimuli (positive examples) and distractors (negative examples). The same tools were used in direct and simultaneous prompt instruction and in organizing probe, instruction, and follow-up sessions. Each concept been taught was analyzed in three steps. For example, the steps for "hot" are as follows: (1) Show the card with the picture of hot from the toolkits consisting of two objects of the same type. (2) Show the card with the hot image from the toolkits consisting of two objects of the same type and different types. (3) Show the student's card with a hot picture from a toolkit consisting of two objects of different types.

A video camera was placed in the individual training room where the study was conducted to record the video in all sessions. Written materials were used for data recording. The Concept List was used to determine the target behavior, and a parental consent form was used for the subjects to participate in the research. Data recording forms for the teaching sessions, which were prepared according to both teaching methods, were used in the research. These forms included defining the concept, related and unrelated qualities, and measurement tool usage instructions. Application reliability data registration forms were used to record the research's application reliability data for instruction and application sessions, as well as direct instruction and simultaneous instruction with daily probe, collective probe, and follow-up sessions. In addition, the Social Validity form prepared by the researcher was used to determine the social validity of the research.

Dependent and Independent Variables of the Research

In the study, the dependent variable was defined as the subjects showing the tool that exemplifies the concept with the desired feature among the two tools shown to them at a level that meets the criteria of at least 8/10. Common concepts in preschool education programs that were unknown to all four subjects were chosen. Parents and teachers preferred to teach hot, cold, hard, and soft concept pairs from the concept pool.

Table 1. Information on subjects, dependent variables, and teaching methods used to teach these dependent variables.

Participants	Concepts Instructed by Direct Instruction	Concepts Instructed by the Simultaneous Prompt Instruction Method
Student 1	Hot	Hard
	Cold	Soft
Student 2	Hard	Hot

	Soft	Cold
Student 3	Hot	Hard
	Cold	Soft
Student 4	Hard	Hot
	Soft	Cold

The independent variables of the research were direct instruction and simultaneous prompt instruction. In direct instruction, which is an independent variable of the research, the environment is structured by the teacher. Positive and negative examples of the concept are presented to the students. Then, both positive and negative examples are tested (for example, "This is soft - This is not soft." After the presentation is made, "Which one is soft?", and "Which one is not soft?"). Teaching with simultaneous prompting, which is another independent variable of the research, is a teaching method in which the controlling prompt is presented immediately after the target stimulus ("Which one is cold?", "This is cold"). In this method, because students are not allowed to react independently during instruction, whether stimulus control transfer is provided or not was tested in probe sessions. The related and unrelated qualities of the concept and its positive and negative examples were determined for the concepts that this research taught. This arrangement is one-to-one for direct instruction; however, some arrangements have been made to present positive and negative examples of the concept together for teaching with simultaneous prompting. While teaching with simultaneous prompting in the teaching process of the application, positive and negative examples of the concept were presented together; however, no instruction was given on the negative example.

Experimental Process

The experimental process consists of teaching, probe (daily probe and full probe sessions), and follow-up sessions.

Full probe sessions are in which all target behaviors in the instruction sets to be taught in the study are evaluated together. The data obtained in the full probe session constitute the full probe phases. In this study, data were collected simultaneously on four antonyms been taught in each probe session. There was no other application on the days of full probe sessions. Only one collective probe session was conducted in one day. Three probe phases were arranged for each subject. The first probe phase was accepted as the baseline phase.

In the first collective probe phase, after three consecutive sessions of stable data were obtained for all target behaviors, the practice phase in which the "hot" and "soft" concepts were taught was initiated. In this phase, the teaching of these two concepts was terminated when three consecutive daily probe sessions for "hot" and "soft" provided 8/10 criteria. In the second collective probe phase, after three consecutive sessions of 8/10 criteria for the concepts of "hot" and "soft", and three stable data points for the not yet implemented concepts of "hard" and "cold", the application phase was started for the concepts of "hard" and "cold". The same procedure was followed in this application phase. In this phase, after three consecutive daily probe sessions regarding the concepts of "hard" and "cold", 8/10 criteria were met, and the third collective probe phase was held. In the third collective probe phase, three sessions on the concepts of "warm", "soft", "hard", and "cold" continued to work in the probe phase until 8/10 criteria were met in three consecutive sessions.

Daily Probe Sessions

Daily probe sessions are data collection sessions related to the concept worked on in the intervention session using both methods. The data collected in the daily probe sessions constitute the intervention data of the research. This study held daily probe sessions before the next teaching session. In this study, each concept is presented in three steps according to the analysis of the concept. In one teaching session, only one step was taught; however, a three-step evaluation was performed in the daily probe session. Ten tool sets were used in the daily probe session for each concept, consisting of three from the second

level and four from the third level. The toolsets used in the daily probe sessions were changed in each session, as in the collective probe sessions; selecting the same toolkits for two consecutive sessions was prevented. While the subjects continued the teaching sessions for the third step of the concept to be taught if they met the 4/5 criterion at three consecutive points in the post-teaching evaluation and the 8/10 criterion at three consecutive points in the daily probe sessions simultaneously, the teaching and daily probe sessions related to the concept studied were terminated. In the daily probe sessions, if the criterion of 8/10 was met at three consecutive points, but 4/5 at three consecutive points was not met in evaluating the steps after the instruction, the daily probe and teaching sessions were continued. In the daily probe sessions, the practitioner and the subject sat opposite each other in the room where the other applications were made. The practitioner stated to the subject, "... now I will ask you a question. You will show me what I am asking you with your finger," after giving the instruction, the response interval is 2 seconds. Ten toolkits used in daily probe sessions were presented to the subjects once. In daily probe sessions, no reinforcement was provided for correct responses to prevent learning, and no corrections were made for incorrect responses.

Intervention Sessions

The transformation of teaching methods in the teaching sessions was completed the same day after the teaching session was completed with one teaching method and the teaching session started with the other method. While transforming the teaching methods, the teaching methods were numbered, and lots were drawn between the numbers. The practitioner planned the practice sessions regarding the four concepts to be taught according to direct and simultaneous prompt instruction. While the concept of "hot" was presented to two of the subjects with simultaneous prompts, the concept of "hard" was presented by direct instruction, the concept of "hot" was presented to the other two subjects by direct instruction, and the concept of "hard" was presented with simultaneous prompting. After defining the teaching with the concepts of "hot" and "hard", the teaching of the other two concepts was started. In the concepts of "soft" and "cold", the concept of "cold" was taught to both subjects by direct instruction, while the concept of "soft" was taught using simultaneous prompt instruction. The other two subjects were taught the concept of "cold" with simultaneous prompt instruction, whereas the concept of "soft" was taught with direct instruction. By drawing lots, it was decided which method would teach which subject.

Each concept was broken down into three steps and then presented as the outcome of a concept analysis. For each step, ten tool sets were used. In both methods, the practice sessions in which the teaching will be conducted are structured in two parts. A teaching session was held in the first part, in which the first five tool sets were presented. The flow of concept presentation for direct and simultaneous prompt instruction in these sessions is shown in Table 1. In the teaching sessions, if the subject reacted incorrectly to the toolset in the first trial, another trial was conducted with the same toolset. If the subject responded correctly in all sets, five attempts were made. After teaching with the five-tool sets, a five-minute break was taken, and then the post-teaching evaluation was made with the second set. In the post-teaching evaluation, instruction was given once for each toolset to which the subject reacted incorrectly. If the subject responded correctly to all toolkits, five trials were conducted. If the subject met the expected 4/5 criteria in the post-teaching evaluation, the instruction and post-teaching evaluation continued until three consecutive sessions met the 4/5 criteria. In the post-teaching evaluation included in the teaching session, the next step was taught after the 4/5 criteria were met at three consecutive points. In the teaching and post-teaching assessment, the subjects' correct responses were consistently marked and reinforced with verbal reinforcers. Instruction was presented again regarding each toolset, and incorrect responses were ignored. In the second teaching presentation, correct responses were constantly reinforced with verbal reinforcements such as "well done" and "very nice". In contrast, incorrect responses were ignored, and the experiment was continued with the other tool set.

Table 2: Concept Presentation with Direct Teaching and Simultaneous Prompt Teaching Method

The following steps were followed using the Direct Instruction Method	**In teaching the concepts.** **In teaching the concepts, the simultaneous teaching method followed the following steps.**
1. Before starting teaching, the teaching environment is made ready. 2. The toolkit is placed on the table. 3. Beginning Teaching 4. Directing students' attention to the study 5. Presenting a positive-negative example of the concept 6. Waiting response interval time 7. Correct response is reinforced 8. Wrong response is ignored (If a wrong response is encountered during the application, the steps after 13 steps are followed.) 9. Asking for a negative example of the concept 10. Waiting response interval time 11. Correct response is reinforced 12. The experiment is repeated with the next set of tools. 13. An incorrect response is ignored 14. Presenting a positive-negative example of the concept 15. Asking for a positive example of the concept 16. Waiting response interval time 17. Correct response is reinforced 18. The wrong response is ignored (if this happens for the second time, the same cycle is continued with the processing steps after 13 steps.) 19. Asking for a negative example of the concept 20. Waiting response interval time 21. Correct response is reinforced 22. The wrong response is ignored (if the exact wrong response happens for the third time, the loop is not continued, and the next step is passed.) 23. The experiment is repeated with the next set of tools. "If the wrong reaction follows the presentation of the positive and/or negative samples, the same cycle is repeated; a second trial is made with the same tool set."	1. Before starting teaching, the teaching environment is made ready. 2. The toolkit is placed on the table. 3. Beginning Teaching 4. Directing students' attention to the study 5. Present the skill guide and controller prompt. 6. Wait for response interval time (2s) 7. Student response 8. The correct response is reinforced. 9. Continue with the next set of tools. 10. The incorrect response is ignored. 11. Trial repetition using the same toolset 12. Presenting skill instruction and checking prompt 13. Waiting for the response interval time 14. The correct response is reinforced. 15. Ignore the wrong response "Error correction for wrong response. Recorded as the number of attempts."

Follow-up Sessions

Follow-up sessions were conducted 1, 3, and 5 weeks after the last probe session. In the follow-up session, as in the full probe sessions, three tool sets for each of the first two steps of four concepts and four tool sets for the third step were randomly determined. Thus, an evaluation was made using 10 toolsets related to a concept. The toolsets used in the follow-up sessions were changed in each session. The dependent variables' presentation order in the follow-up sessions was arranged randomly. In the follow-up session, the subject and the practitioner sat at the table opposite each other. The practitioner asked the subject all the target stimuli determined once and waited 2 seconds for the subject to answer the question. In the follow-up sessions, no reinforcement schedule was applied to correct or incorrect responses of the subjects.

Research Group

The study group consists of the practitioner, participants, and observer. The prerequisite features sought by the study's aims in the participants forming the study group of this research are as follows: (a)The

participants to be trained in the study must have a diagnosis of autism spectrum disorder. Adequacy to enable the teaching of single-instruction instructions/skills. (b)Absence of behavioral problems that hinder the teaching process. (c)Ability to focus attention on visual, auditory, and tactile stimuli for at least three or five minutes. (d)Ability to choose among objects. (e) reacting to the name, (f) providing waiting behavior, (g) having toilet control.

The participants continued to study at the Necmettin Erbakan University Autism Studies Application and Research Center, and they did not have a concept teaching study in their previous educational life using direct instruction and simultaneous prompt instruction, the effectiveness and efficiency of which were investigated. The study participants were seven years old: two girls (Student 1 and Student 2) and two boys (Student 3 and Student 4) with autism spectrum disorder.

Table 3: Characteristics of the subjects participating in the research

SUBJECT	GENDER	AGE	DIAGNOSIS	ACCOMPANYING DEFICIENCY
Student 1	Girl	7	Autism Spectrum Disorder	None
Student 2	Male	7	Autism Spectrum Disorder	None
Student 3	Girl	7	Autism Spectrum Disorder	None
Student 4	Male	7	Autism Spectrum Disorder	None

The practitioner in the study group of this research has 20 years of experience with students with ASD and is a Ph.D. lecturer. The practitioner has studied autism, direct instruction, errorless teaching methods, and single-subject research.

The observer in the study group of this research has experience in direct and errorless teaching methods and has 22 years of experience working as a faculty member in the special education department. In this context, the observer was informed about the steps to be followed while applying both teaching methods, how these steps were performed, and the definitions of correct and incorrect responses.

Data Collection Tools and Analysis

In this research, the data are presented graphically. In the graph created, the number of sessions is on the x-horizontal axis, and the quantitative representation of the dependent variable is on the y-vertical axis. Research data, application reliability data, interobserver reliability data, effectiveness data, efficiency data, and social validity data are stated below.

Collection of Application Reliability Data:

The researcher prepared an application reliability form to evaluate the teaching within the scope of the research. In this prepared form, the steps of the stages in the sessions (The application steps observed for direct teaching are: (1) control of the tools and equipment to be used in teaching, (2) directing attention, (3) "This... This... is not..." regarding the positive and negative examples. .", (4) asking about the tool that exemplifies the concept, (5) waiting 2 seconds, (6) responding correctly to the subject's reactions, (7) asking about the tool that does not exemplify the concept, (8) waiting 2 seconds, (9) responding to the subject's reactions giving correct responses (10) and waiting 2 seconds between trials. The application steps observed for teaching with simultaneous prompting are (1) control of the tools and equipment to be used in teaching, (2) directing attention, (3) presenting the skill instruction, (4) presenting the controlling clue following the skill instruction, (5) responding correctly to the subject's reactions, (6) waiting 2 seconds between trials. Steps to be followed in simultaneous prompting and direct teaching probe and monitoring sessions: (1) Control of the tools and equipment to be used in teaching, (2) directing attention, (3) presenting the skill instruction, (4) responding correctly to the subject's reactions, (5) 2 seconds between trials has been determined as pending, and columns are marking whether these notifications have occurred or not. All application sessions were recorded with a camera, and two faculty member field experts determined by impartial assignment monitored 30% of them. Field experts followed the records and marked the steps that were fulfilled in the form given to them. When calculating the application reliability coefficient, the percentage of observed practitioner

behavior was divided by planned practitioner behavior. Implementation reliability was calculated by observers' evaluations of the videos they watched using the formula [(observed implementer behavior/planned implementer behavior) 100] (Erbaş, 2012). As a result of the calculations, it was determined that the application reliability in this research was 100%. The high level of practitioner reliability helped us conclude that the practitioner taught as planned.

Collection of Interobserver Reliability Data: Interobserver reliability is calculated by dividing the interobserver agreement by the sum of the interobserver agreement and interobserver disagreement and taking the percentage (consensus/disagreement x 100) (Miles & Huberman, 1994). The data recorded by the observer were compared with the researcher's records, and the inter-observer reliability was found to be 93% for the concept of hot and 96% for the concept of cold. The reliability percentages of the concepts related to the teaching sessions with the Simultaneous Prompt Teaching Method to Student 1 were determined to be 95% for the hard concept and 100% for the soft concept. Student 1's reliability percentages for the collective probe sessions were 92% for the concept of hot, 95% for the concept of cold, 94% for the concept of hard, and 95% for the concept of soft. Student 1's reliability percentages for the monitoring sessions were 100% for the concept of hot, 100% for the concept of cold, 100% for the concept of hard, and 100% for the concept of soft. The reliability percentages of the concepts related to the teaching sessions using the Direct Teaching Method to Student 2 were determined as 90% for the hard concept and 100% for the soft concept. The reliability percentages of the concepts related to the teaching sessions with the Simultaneous Prompt Teaching Method to Student 2 were determined to be 100% for the concept of hot and 92% for the concept of cold. Student 2's reliability percentages for the total probe sessions were 92% for the concept of hard, 97% for the concept of soft, 96% for the concept of hot, and 90% for the concept of cold. Student 2's reliability percentages for the monitoring sessions were 100% for the concept of hard, 100% for the concept of soft, 100% for the concept of hot, and 100% for the concept of cold. The reliability percentages of the concepts related to the teaching sessions with the Direct Instruction Method to student 3 were found to be 95% for the concept of hot and 95% for the concept of cold. The reliability percentages of the concepts related to the teaching sessions with the Simultaneous Prompt Teaching Method to Student 3 were determined as 93% for the hard concept and 97% for the soft concept. Student 3's reliability percentages for the collective probe sessions were 94% for the concept of hot, 91% for the concept of cold, 94% for the concept of hard, and 98% for the concept of soft. Student 3's reliability percentages for the monitoring sessions were 100% for the concept of hot, 100% for the concept of cold, 100% for the concept of hard, and 100% for the concept of soft. The reliability percentages of the concepts related to the teaching sessions with the Direct Teaching Method to Student 4 were determined as 91% for the hard concept and 96% for the soft concept. The reliability percentages of the concepts related to the teaching sessions with the Simultaneous Prompt Teaching Method to Student 4 were determined as 96% for the concept of hot and 94% for the concept of cold. Student 4's reliability percentages for the total probe sessions were 90% for the concept of hard, 98% for the concept of soft, 97% for the concept of hot, and 92% for the concept of cold. Student 4's reliability percentages for the monitoring sessions were 100% for the concept of hard, 100% for the concept of soft, 100% for the concept of hot, and 100% for the concept of cold.

Collection of Effectiveness Data: The effectiveness of two teaching methods in teaching concepts that indicate quality to children with ASD was examined. The correct response numbers of the subjects for the efficacy data are shown graphically. On the graph, it was observed that the desired criterion was met in a shorter time with the teaching method.

Collection of Efficiency Data: To determine whether the two teaching methods differed in terms of efficiency, data were collected on (1) the number of attempts until the criterion was met, (2) the number of false responses until the criterion was met, and (3) the total time until the criterion was met.

Collecting Social Validity Data: A Social Validity Form was created by the researcher to determine the social validity of the research and the functionality of the target behaviors to be gained in the research, the suitability of the tools and methods used for the subjects, and the changes that occurred in

their children during the study. The social validity form was completed by the people responsible for the education and care of the children participating in the study, as they could constantly follow the changes in their children and spend the whole day with them. The social validity form was given to the parents in sealed envelopes on the day that each mother was shown two teaching sessions with her children. The parents filled out the forms and left them.

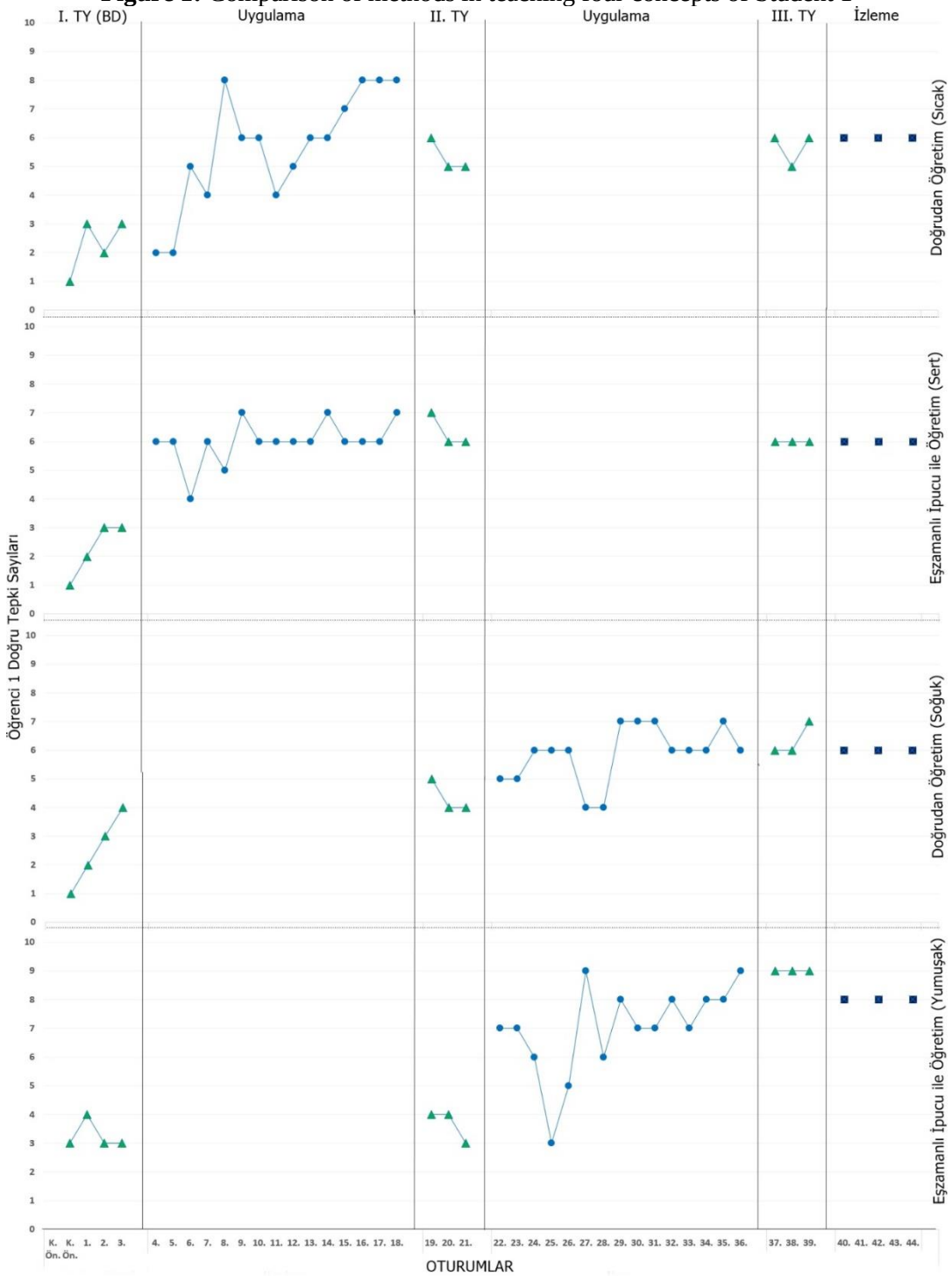
Ethical Considerations

"Higher Education Institutions Scientific Research and Publication Ethics Directive" was followed. This study was found appropriate by the Necmettin Erbakan University Social and Humanities Ethics Committee with the decision dated 12.04.2023 and numbered 2023–151.

Findings

The first of the sub-objectives was to determine the acquisition level differences between the "hot" and “cold "concepts taught to Student 1 by direct instruction method and the "hard" and “soft” concepts taught using simultaneous prompting. The findings and interpretations of the research statement are presented below.

Figure 1: Comparison of methods in teaching four concepts of Student 1



The graphical analysis interpretations of the data for student 1 to determine whether the acquisition level of the concept differs are as follows;

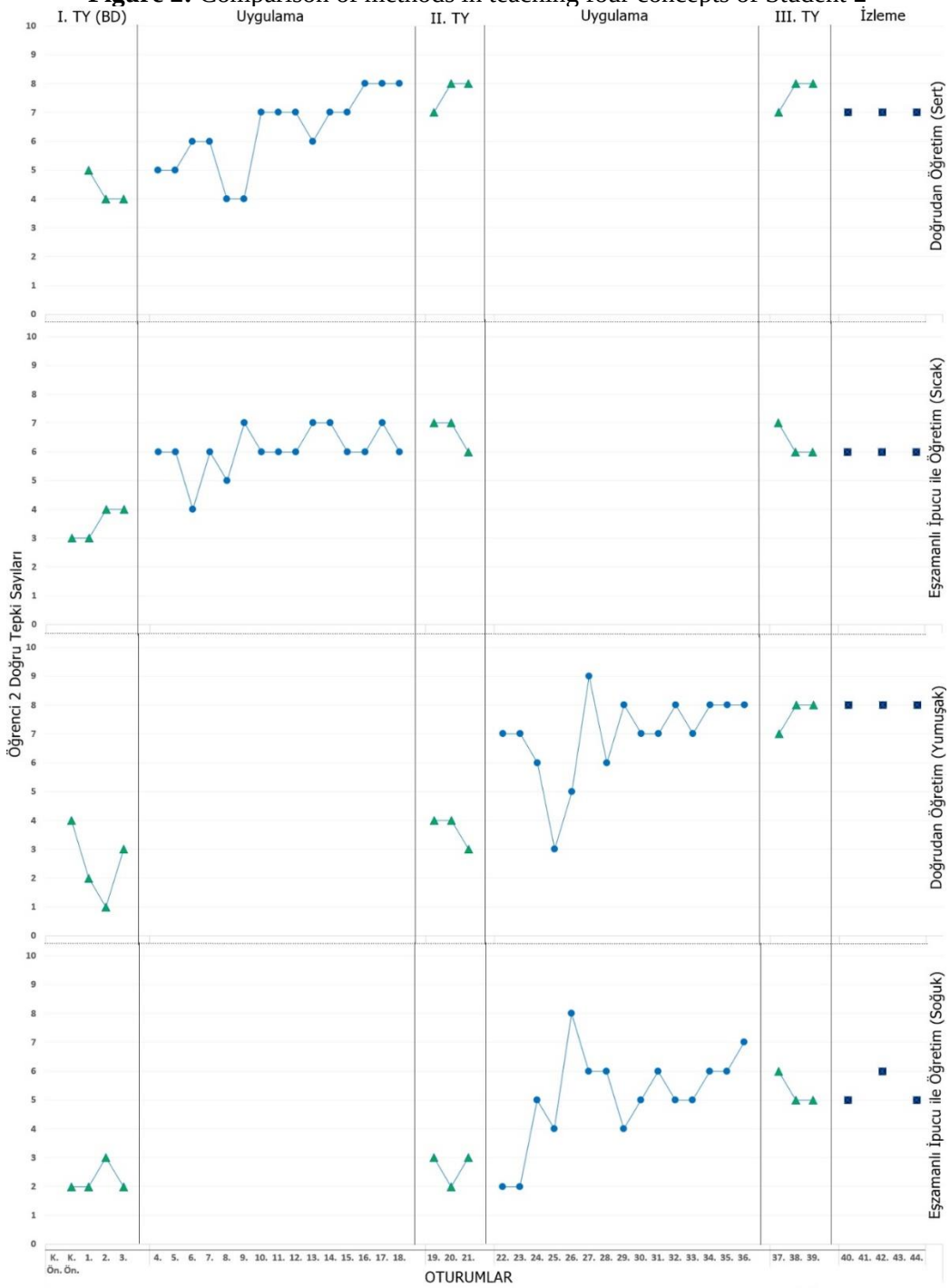
The impact of simultaneous prompting in the teaching of the concept of "hard" and the direct method in the teaching of the concept of "hot" on the participant was examined, and the average number of correct responses before teaching the concept of "hard," which is taught using the simultaneous prompt teaching method, was 2.7/10. The teaching process assessments had an average score of 6/10. The post-teaching evaluation average was 6.3/10. The average of the collective probe session after the teaching was 6/10 for three weeks, and in the evaluation made for the follow-up once a week, it was 6/10 in the

first week, 6/10 in the third week, and 6/10 in the fifth week. This result shows that although the teaching does not meet the criteria, it has continuity. The average of the correct response number before the teaching of the concept of "hot", which is taught with the direct instruction method, is 2.7/10, the average of the evaluations of the teaching process is 5.7/10, and the average of the post-teaching evaluation is 5.3/10. The average collective probe session after the teaching was 5.7/10. In the evaluation for the follow-up assessments made for three weeks and once a week, it was 6/10 in the first week, 6/10 in the third week, and 6/10 in the fifth week. This result showed that although the instruction met the criteria, its permanence was not permanent.

When the effect of simultaneous prompting in the teaching of the concept of "soft" and the direct method in the teaching of the concept of "cold" on the participant is examined, the average number of correct responses before the teaching of the concept of "soft", which is taught with the simultaneous prompt teaching method pre-teaching collective probe session, was 3.3/10, the average baseline level was 3.7/10, the average teaching process was 7/10, and the post-teaching evaluation average was 9/10. In the evaluation made for the follow-up, it was 8/10 in the first week, 8/10 in the third week, and 8/10 in the fifth week. This result shows that the teaching met the criteria and has continuity. The average of the number of correct responses before the teaching of the concept of "cold", which is taught with the direct teaching method, the average of the pre-teaching collective probe session is 2.5/10, the average of the beginner level 4.3/10, the teaching process average is 5.9/10, and the average of the post-teaching session is 2.5/10. It was seen that the average of the evaluation was 6.3/10. In the evaluation made for the follow-up, it was 6/10 in the first week, 6/10 in the third week, and 6/10 in the fifth week. This result showed that although the instruction met the criterion, the follow-up sessions did not continue in line with the criterion.

The second of the sub-objectives was to determine the acquisition level differences between the "hard" and “soft” concepts taught to Student 2 by direct instruction method and the "hot" and “cold” concepts taught using simultaneous prompting. The findings and interpretations of the research statement are presented below.

Figure 2: Comparison of methods in teaching four concepts of Student 2



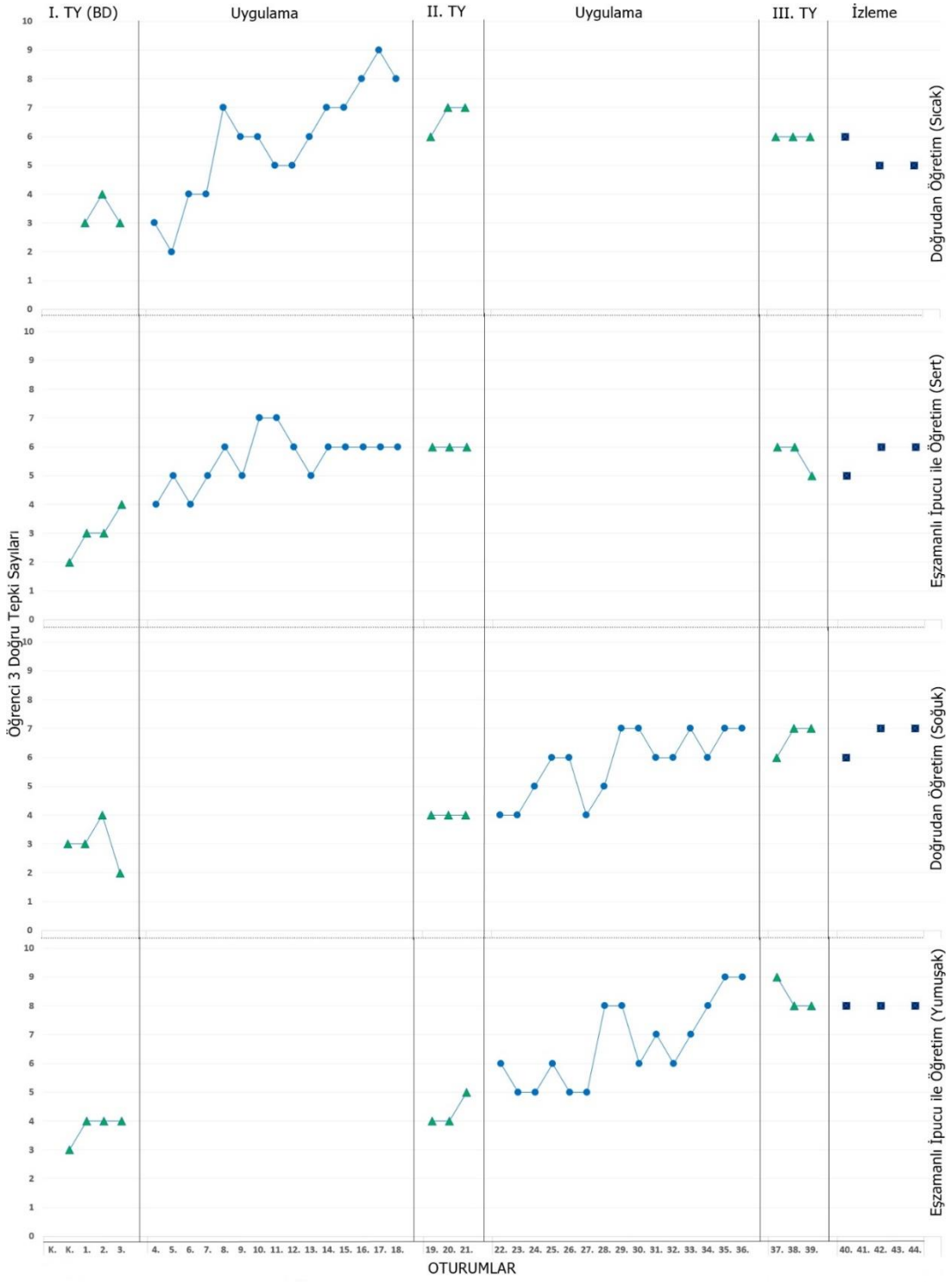
The effect of teaching methods with simultaneous prompting in teaching "Hot" and in teaching "Hard" is examined, and the average number of correct responses before teaching the concept "Hot", which is taught with the simultaneous prompt teaching method, is 3.7/10. It was observed that the average of the teaching process evaluations was 6.1/10, and the post-teaching evaluation average was 6.7/10. The average of the collective probe session after the teaching was 6.3/10 for three weeks, and in the evaluation made for the follow-up once a week, it was 6/10 in the first week, 6/10 in the third week, and 6/10 in the fifth week. This result shows that although the instruction does not meet the criteria, the level of learning is continuous. The average of the correct response number before the teaching "hard", which is taught with the direct teaching method, is 4.3/10, the average of the teaching process evaluations is 6.3/10, and the average of the post-teaching evaluation is 7.7/10. The average collective

probe session after the teaching was 7.7/10. In the evaluation made for the follow-up, it was 7/10 in the first week, 7/10 in the third week, and 7/10 in the fifth week. This result showed that although the instruction met the criterion, the follow-up sessions did not continue in line with the criterion.

The effect of simultaneous prompting and direct teaching methods in the teaching of the concept of "soft" and "cold" on the participant is examined, and the average of the number of correct responses before the teaching of the concept of "cold", which is taught with the simultaneous prompt teaching method, was 2.3/10. The average of the pre-teaching probe session was 2.7/10, the average of the baseline was 5.1/10, and the average of the post-teaching evaluation was 5.3/10. In the evaluation made for the follow-up evaluation for three weeks, once a week, it was 5/10 in the first week, 6/10 in the third week, and 5/10 in the fifth week. Although this result shows that the teaching does not meet the criteria, the learning acquired is continuous. For the evaluation average of the number of correct responses to the concept of "soft", which is taught with the direct instruction method, the average of the pre-teaching collective probe session was 2.5/10, the average of the baseline was 3.7/10, the teaching process level was the post-teaching evaluation average was 7.7/10. In the evaluation made for the follow-up evaluation once a week for three weeks, it was 8/10 in the first week, 8/10 in the third week, and 8/10 in the fifth week. This result shows that the teaching met the criteria and has continuity.

The third of the sub-objectives was to determine the acquisition level differences between the "hot" and “cold "concepts taught to Student 3 by the direct instruction method and the "hard" and “soft” concepts taught using simultaneous prompting. The findings and interpretations of the research statement are presented below.

Figure 3: Comparison of methods in teaching four concepts of Student 3



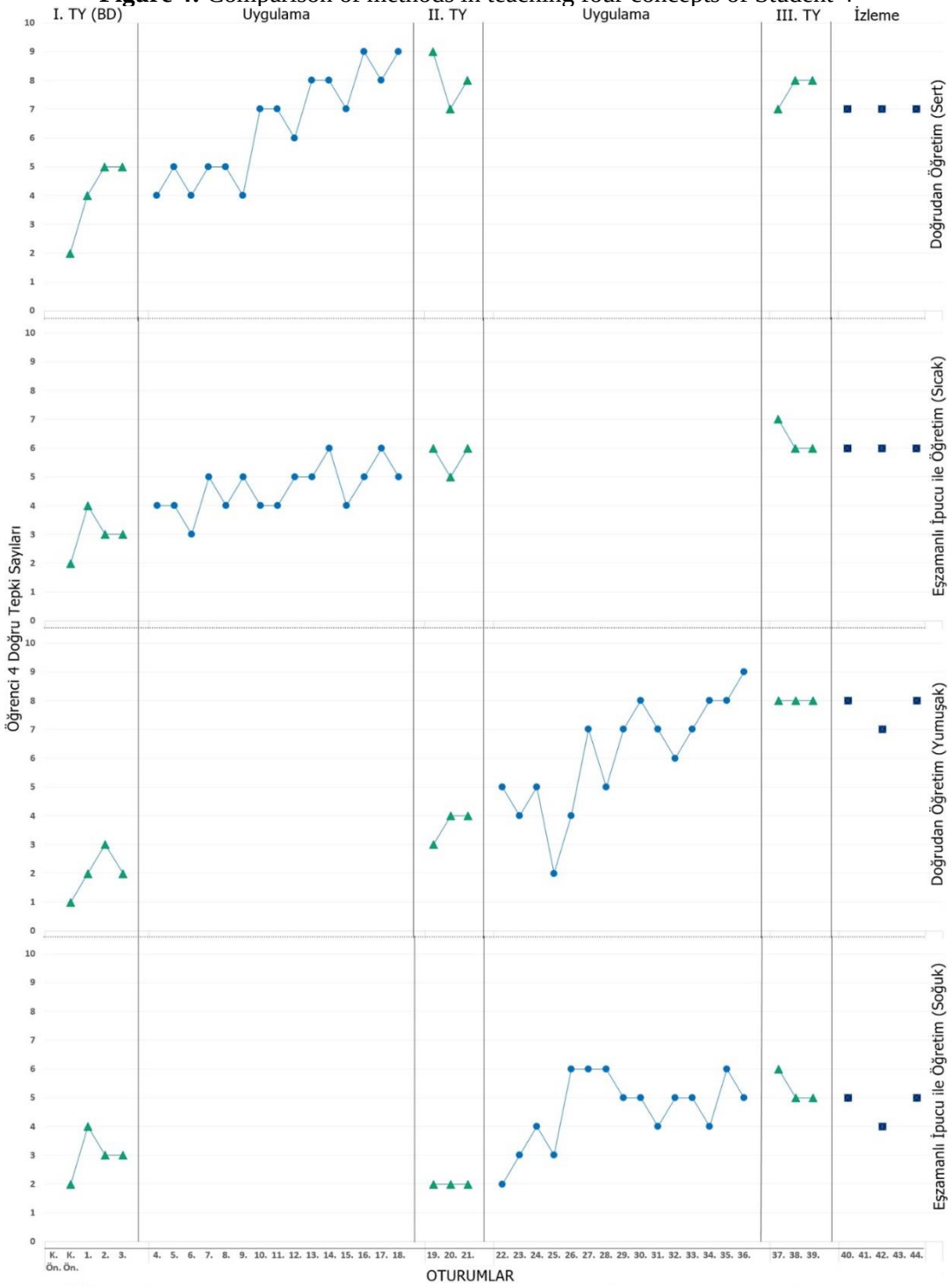
The average number of correct responses before the teaching of the concept of "hard", which is taught with the simultaneous prompt teaching method, was 3.3/10, the average of the teaching process evaluations was 5,6/10, and the post-teaching evaluation average was 6/10. The average of the collective probe session after the teaching was 5,7/10 and in the evaluation made for the follow-up evaluation made once a week, it was 5/10 in the first week, 6/10 in the third week, and 6/10 in the fifth week. This result shows that although the teaching does not meet the criteria, it has continuity. The

average of the correct response number before the teaching of the concept of "hot", which is taught with the direct instruction method, is 3,3/10, the average of the evaluations of the teaching process is 6,2/10, and the average of the post-teaching evaluation is 3.3/10. The average collective probe session after the teaching was 6.7/10. In the evaluation made for the follow-up, it was 6/10 in the first week, 5/10 in the third week, and 5/10 in the fifth week. This result showed that although the instruction met the criterion, the follow-up sessions did not continue in line with the criterion.

The average number of correct responses before the teaching of the concept of "soft", which is taught with the simultaneous prompt teaching method pre-teaching collective probe session average was 2.3/10, the average the baseline level was 2.7/10, the average of teaching process was 5,1/10, and the post-teaching evaluation average was 5,3/10. In the evaluation made for the follow-up evaluation once a week for three weeks, it was 8/10 in the first week, 8/10 in the third week, and 8/10 in the fifth week. This result shows that the teaching met the criteria and has continuity. The average of the number of correct responses before the teaching of the concept of "cold", which is taught with the direct teaching method, the average of the pre-teaching collective probe session is 2.5/10, the average of the beginner level is 3,7/10, the teaching process average is 6.9/10, and the average of the post-teaching session is 7,7/10. In the evaluation made for the follow-up evaluation once a week for three weeks, it was 8/10 in the first week, 8/10 in the third week, and 8/10 in the fifth week. This result shows that the teaching met the criteria and has continuity.

The fourth of the sub-objectives was to determine the acquisition level differences between the "hard" and “soft” concepts taught to Student 2 by direct instruction method and the "hot" and “cold” concepts taught using simultaneous prompting. The findings and interpretations of the research statement are presented below.

Figure 4: Comparison of methods in teaching four concepts of Student 4



The average number of correct responses before teaching the concept of "Hot", which is taught with the simultaneous prompt teaching method, is 3/10. It was observed that the average of the teaching process evaluations was 4,6/10, and the post-teaching evaluation average was 5.7/10. The average of the collective probe session after the teaching was 6.3/10 for three weeks, and in the evaluation made for the follow-up, it was 6/10 in the first week, 6/10 in the third week, and 6/10 in the fifth week. This result shows that although the instruction does not meet the criteria, the level of learning is continuous. The average of the correct response number before the teaching of the concept of "hard", which is taught with the direct teaching method, is 4/10, the average of the teaching process evaluations is 6.4/10, and the average of the post-teaching evaluation is 8/10. The average collective probe session after the

teaching was 7.7/10. In the evaluation made for the follow-up evaluation once a week for three weeks, it was 7/10 in the first week, 7/10 in the third week, and 7/10 in the fifth week. This result showed that although the instruction met the criterion, the follow-up sessions did not continue in line with the criterion.

When the effect of simultaneous prompting and direct teaching methods in the teaching of the concept of "soft" and "cold" on the participant is examined, the average of the number of correct responses before the teaching of the concept of "cold" which is taught with the simultaneous prompt teaching method was 3/10, the average of the pre-teaching probe session was 2/10 the teaching process average was 4,6/10, and the average of the post-teaching evaluation was 5.3/10. In the evaluation made for the follow-up, it was 5/10 in the first week, 4/10 in the third week, and 5/10 in the fifth week. Although this result shows that the teaching does not meet the criteria, the learning is continuous. For the evaluation average of the number of correct responses to the concept of "soft", which is taught with the direct instruction method, the average of the pre-teaching collective probe session is 2/10, the average of the baseline is 3.7/10, and the teaching process level is 6.1/10. The post-teaching evaluation average was 8/10. In the evaluation made for the follow-up, it was 8/10 in the first week, 7/10 in the third week, and 8/10 in the fifth week. This result shows that the teaching met the criteria and has continuity.

The fifth sub-problem of the research, "When the concepts with independent variables are taught to students with autism spectrum disorder using direct instruction and simultaneous prompt instruction, does the effectiveness of the two methods differ in the follow-up sessions to be held in the first, third, and fifth weeks after the instruction?" The findings and interpretations of this statement are as follows.

In this study, in the first, third, and fifth weeks after the teaching of the skill of demonstrating qualitative concepts with the desired characteristics was completed, follow-up sessions were held, and monitoring data were collected to evaluate whether the learned target behaviors retained their permanence. For Student 1: While the concept of "hot" met the criterion in direct teaching, it fell below the criterion in the follow-up sessions, the concept of "hard" was below the criterion in both simultaneous prompting and follow-up sessions, and the concept of "cold" was below the criterion in both direct instruction and follow-up sessions. It was observed that the criterion was met both in the teaching with simultaneous prompts and in the follow-up sessions. For Student 2: While the concept of "hard" met the criteria in direct teaching, it fell below the criterion in the follow-up sessions, the concept of "Hot" was below the criterion in teaching with simultaneous prompts and in the follow-up sessions, the criterion was met in the direct teaching of the concept of "soft" and in the follow-up sessions, the concept of "cold" was below the criterion in both teaching and follow-up sessions. For Student 3: While the concept of "hot" met the criterion in direct teaching, it fell below the criterion in the follow-up sessions, the concept of "hard" was below the criterion in both simultaneous prompting and follow-up sessions, and the concept of "cold" was below the criterion in both direct instruction and follow-up sessions. The criterion was met in the teaching with simultaneous prompting and in the follow-up sessions. For student 4, while the concept of "hard" met the criterion in direct teaching, it fell below the criterion in the follow-up sessions. The concept of "hot" was below the criterion in teaching with simultaneous prompts and in the follow-up sessions. In the direct teaching of the concept of "soft" the criterion was met at a rate of 2/3 in the follow-up sessions, It was observed that the concept of "cold" was below the criterion in both simultaneous prompting and follow-up sessions.

The sixth sub-problem of the research, “Does the efficiency of direct instruction and simultaneous prompting differ in teaching concepts that have an independent variable to students with autism spectrum disorder?” The findings and interpretations of the statement are as follows.
In this study, the effectiveness and efficiency of teaching with simultaneous prompting and direct teaching were compared to determine whether the two teaching methods differ in terms of efficiency, Data were collected on (a) the number of trials until the criterion was met, (b) the number of false responses until the criterion was met, (c) the total time until the criterion was met. The data on these variables for the four subjects participating in the study are as follows.

Table 5. Efficiency data for concept teaching using direct instruction and simultaneous prompts

	direct instruction						simultaneous prompt				
Participant	Target Behavior	Number of Sessions	Number of attempts	Number of incorrect responses Positive Example	Negative Example	Süre (min: sec)	Target Behavior	Number of Sessions	Number of attempts	Number of incorrect responses	Duration (min: sec)
Student 1	*Hot	15	288	76	86	100:12	Hard	15	224	26	87:36
	Cold	15	275	22	81	97:42	*Soft	15	208	32	82:00
Total		*30*	*563*	*98*	*167*	*197:54*		*30*	*432*	*58*	*169:36*
Student 2	*Hard	15	341	36	41	114:26	Hot	15	171	18	72:45
	*Soft	15	286	88	82	98:20	Cold	15	222	12	68:12
Total		*30*	*627*	*124*	*123*	*212:46*		*30*	*393*	*30*	*140:57*
Student 3	*Hot	15	269	55	62	95:12	Hard	15	188	44	77:33
	Cold	15	271	36	61	92:14	*Soft	15	168	48	72:08
Total		*30*	*540*	*91*	*123*	*187:26*		*30*	*356*	*92*	*149:41*
Student 4	*Hard	15	301	62	54	107:32	Hot	15	199	26	68:58
	*Soft	15	269	58	51	93:14	Cold	15	203	16	74:12
Total		*30*	*570*	*120*	*95*	*200:46*		*30*	*402*	*42*	*143:10*

The target behaviors of the participants, the number of teaching sessions for these behaviors, the number of trials in these sessions, and the total duration of these trials are given. Based on the knowledge that efficiency can be interpreted in student and target behaviors when teaching is effective (meeting the criterion), hot, hard, and soft concepts, except for the cold, which were taught by direct instruction method, met the criteria, the number of attempts, the number of wrong responses, and the application times were higher than the simultaneous prompt. While it is effective and efficient at the teaching level for direct instruction, it is labor- and time-consuming in terms of time and number of attempts. While two of the students (Student 1, Student 3) met the "soft" teaching success criterion, which is one of the concepts taught with the simultaneous prompt teaching method, the teaching success criterion was not met for the other three concepts (hot, hard, cold). Compared with direct instruction, the number of attempts, wrong responses, and application times were fewer. At the same time, it can be claimed that it is effective and efficient only for the concept of "soft" teaching level for simultaneous prompts. It is an economical method in terms of time and number of attempts. In the applications using simultaneous prompting, compared with those made with direct instruction, four subjects were effective only in the concept of "soft". The number of attempts, session times, and wrong response numbers are lower in teaching with simultaneous prompting. As a result, direct instruction is found to be more efficient in teaching. Simultaneous prompting is more efficient in terms of the number of trials, session durations, and number of wrong responses.

What are the views (social validity findings) of the parents of the students who have been taught hot, cold, hard, and soft concepts to their students with ASD, and the methods and tools used in this process?

The social validity study is based on (a) the functionality of the parents of the children participating in the study to learn the concepts for their children, (b) whether the teaching methods and materials used are suitable for their children, (c) the changes that occur in their children during the study and the experiences in this process, (d) which teaching method is more suitable for their children. All four parents who participated in the study stated that the concepts taught were important for their children and that it was positive for their children to use them correctly in school and daily life. Again, the parents who participated in the study stated that they could participate in another study similar to this study conducted under any circumstances. All of the parents used the concepts their children learned correctly at home and while playing; they even stated that they observed that they created a game similar to the work done to teach these concepts to the children around them. The parents stated that they did not encounter a situation that they did not like during the study; on the contrary, they stated that their children's vocabulary increased, they were able to use question patterns (which?), their children worked more regularly at the desk, and they understood the instructions better. All parents stated that direct teaching sessions were better for their children. They stated that their children learned to make comparisons better, and they did not forget what they had learned because the opposite concepts of the concepts taught were also presented in this method. All of the mothers stated that the large number of materials used in the study was positive for their children; thus, they stated that they could use the concepts they learned in the objects around them.

Discussion

In this study, the effectiveness and efficiency of direct instruction and simultaneous prompting in teaching the skills of showing the hot, cold, hard, and soft concepts to students with ASD and the permanence of the skills acquired first the third and fifth weeks after the end of the instruction was investigated.

The findings obtained from the research showed that the effectiveness of direct teaching and simultaneous prompting and teaching methods of concepts (hot, soft, hard, cold) for four subjects in teaching concepts, the effectiveness of teaching, and the effectiveness of teaching varied between concepts. It was seen that the subjects were effective in a single concept for students 1 and 3 in the teaching step. Among the peers, it was seen that for students 3 and 4, it was effective in both concepts taught with the direct teaching method in the teaching step. In terms of the variation in the teaching methods of the subjects, it was seen that the "direct teaching method" was effective in teaching the concept of "hot" in the teaching step for students 1 and 3. Simultaneously, it was observed that the "hard" and "soft" concepts were determined in the teaching of the "hard" and "soft" concepts in Students 2 and 4. It is seen that the "direct teaching method" is effective because it meets the criteria. Therefore, the "direct teaching method" in the teaching step for students 2 and 4 among the subjects was more effective on the concepts taught to the other subjects (S1, S3). Therefore, this finding is also consistent with previous studies (Akgün and Gürsel, 2022; Oktav and Yıkmış, 2022; Yenioğlu et al., 2022; Şafak and Bilgiç, 2021; Tufan et al. 2020; Çay, 2019; Özlü and Yıkmış, 2019; Root et al., 2017; Kot et al., 2017; Batu et al., 2014; Rockwell et al., 2011;). According to the findings of the collective probe sessions and post-teaching follow-up sessions after the end of the teaching, the concepts of "hot" and "cold" for Student 1, "hard" for Student 2, "hot" and "cold" for Student 3, and "hard" for Student 4 met the teaching criteria. However, in the follow-up sessions of the teaching, they did not meet the criteria, and it was not consistent. In the evaluations made for the follow-up evaluation of Student 2's "Soft" concept, it is seen that the criterion has been met. It also showed that the instruction met the criteria and had continuity. In the evaluations made for the "soft" follow-up evaluation of Student 4, it was seen that the criterion was met in the third and fifth weeks. However, it was observed that the criterion was not met in the first week, and it showed that the instruction met the criterion and had continuity. Among the peers, it can be stated that the "direct teaching method" was effective in the teaching of a single concept (soft) in Students 2 and 4, according to meeting the criteria of collective probe and follow-up session.

In contrast, the "direct teaching method" was ineffective in teaching other subjects and concepts because it did not meet the criterion. However, it was observed that the subjects continued the target behaviors gained in the follow-up sessions held in the first, third, and fifth weeks after the end of the instruction. Direct instruction is also effective in ensuring permanence. Güneş (2022), Aydın and Tekin-İftar (2020), Özlü and Yıkmış (2019), Root et al. (2017), Batu et al. (2014) show that direct instruction is also effective in ensuring permanence.

In the research findings regarding the effectiveness of simultaneous prompting in teaching the concepts of "hot, soft, hard, cold"; only the concept of "soft" was found to be effective in teaching (Student 1 and Student 3). In the teaching of the concepts of "hot, hard, cold" (Student 1, student 2, student 3, student 4), it was observed that the simultaneous prompting teaching method was not effective since the teaching on the effectiveness did not meet the criteria. However, it shows that acquired learning is continuous.

The research findings showed consistency in teaching the students' names and single-step behaviors. The findings of the study showed differences in the follow-up sessions and the continuity of the permanence of the target behaviors with studies of Yücesoy Özkan and Altın (2019), Metcalfe (2017), Tulis (2013), Ferris (2015), Doğan and Özen, (2022), Atıf Ünal and Toper (2021), Collins et al (2017), Swain et al. (2015), Yücesoy (2011) regarding the teaching method with simultaneous prompts, academic skills, objects, and symbols. However, three subjects did not meet the criteria in the follow-

up sessions held in the first, third, and fifth weeks after the end of the instruction. The continuation of the acquired target behaviors (soft) showed continuity in ensuring the permanence of the instruction with simultaneous prompting. In addition, in the social validity findings, the opinions of the parents about the method that is more suitable for their children are also in favor of direct instruction. In this study, 15 sessions were held for both concepts, and in the last three-day probe session, it was attempted to obtain correct responses that would meet the 8/10 criterion in a row.

In this study, the direct teaching method of the taught concept teaching on the subjects was more effective than simultaneous prompt teaching. The number of attempts, the duration of the sessions, and the number of wrong responses were less in simultaneous prompting (See Table 5), and direct instruction was more efficient. Efficiency in terms of the number of false responses was due to the skill instruction being presented first while presenting with the simultaneous prompt, and then the controlling prompt without allowing a wrong response, while the efficiency in terms of session times and the number of attempts was because there was no oral presentation about it except for showing the negative example. The negative example was not provided because there is no need for evaluations.

Result

The findings obtained as a result of the study examined whether there was a difference in the teaching of the concepts of hot, cold, hard, and soft applied to Student 1, Student 2, Student 3, and Student 4 between the direct instruction method and simultaneous prompt. The following results were obtained in this study.

1) The direct teaching method was effective in a single concept for students 1 and 3 in the teaching step of the subjects.
2) Among the subjects for students 3 and 4, it was seen that it was effective in both concepts that were taught with the direct teaching method in the teaching step.
3) In terms of the variation in the teaching methods of the subjects, it was seen that the "direct teaching method" was effective in teaching the concept of "hot" in the teaching step for students 1 and 3.
4) In Student 2 and Student 4, it was seen that the direct teaching method was effective in teaching the concepts of "hard" and "soft".
5) Therefore, among the subjects, it was stated that the "direct teaching method" in the teaching step for Student 2 and Student 4 was more effective on the concepts taught to the other subjects (S1, S3).
6) Findings about the effectiveness of teaching with simultaneous prompting; only the concept of "soft" was found to be effective in teaching (Student 1 and Student 3).
7) In this study, it was seen that the simultaneous prompting method was not effective for Student 1, student 2, student 3, and Student 4 in teaching the concepts of "hot, hard, cold".
8) The results in terms of efficiency in this research: Considering the number of attempts, session durations, and the number of wrong responses, it was revealed that the direct teaching method was more efficient than the simultaneous prompt teaching method.

Limitations and Recommendation

The limitations of this study are outlined below:

1) Teaching the concepts of hot, cold, hard, and soft
2) A group of four student subjects with a diagnosis of autism spectrum disorder
3) Teaching processes with direct teaching methods and simultaneous prompting
4) Necmettin Erbakan University Autism Studies Application and Research Center is the limitation of our study, which was to be conducted two days a week for each subject.

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